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Direct Metal Laser Sintering of Inconel 718 for J-2X Components

Direct Metal Laser Sintering (DMLS) is an additive manufacturing technology that NASA hopes to utilize to produce complex J-2X engine parts made of Inconel 718, a nickel-chromium super alloy. We performed a comprehensive series of tensile, low and high cycle fatigue, fracture toughness, and fatigue crack growth tests at temperatures ranging from -320°F to 1200°F. We will use this data to determine whether or not DMLS Inconel 718 is an acceptable replacement for wrought Inconel 718. Ultimately this study will help NASA improve the strength, durability, and reliability of parts that currently require strength-reducing welding processes to manufacture, while simultaneously reducing cost of production.

Research and Experience

- **Marshall Space Flight Center, NASA Academy Summer Research Associate, Summer '12**
  Performed tests and analysis of Laser Sintered Inconel 718 for J-2X applications.
  Designed and built two cryostat support structures using Solid Edge.
  Supported all cryo and high temperature materials testing including permeability composites testing, tensile, adsorbent bead crush testing, J1C, High Cycle Fatigue, etc.
- **Columbia University, Research Assistant (Jan '11 – May '12)**
  Ran experiment on low temp conversion of H2O into H2 fuel.
  Troubleshot experiment apparatus and design, predominantly leak-plugging.
  Presented findings to team weekly on progress of experiment towards publication.

Memberships and Activities

AIAA Design-Build-Fly, Student Council, Columbia University Orchestra, Undergraduate Recruitment Committee, New Music Society, Chinese Language Activities

Honors, Awards

Dean's List (Fall 09 – Spring 12)
Edwin and Elizabeth Bright Engineering Scholar 2010-2012
Chinese Bridge Speech Competition (April 2011) – 2nd Place in Northeast US, Intermediate division
Beijing Summer inter-program Chinese Speech Competition 2011 – 2nd Place, Advanced Division